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Amendment to description

DISCLOSURE OF THE INVENTION

An object of the present invention is to provide a disk drive and drive unit driving mechanism that are simple and small and which allow each part to operate smoothly.

In order to constitute the above object, the present invention possesses the following technological characteristics in a disk drive comprising a disk holder that comprises a plurality of disk holding members that individually hold a plurality of disks, a drive unit for playing back a desired disk, a disk selector that forms a space above and below the desired disk by causing the disk holding members to rise and fall; and drive movement means that allows the drive unit to move into a space that is formed by the rise and fall of the disk holding members

That is, the present invention is characterized in that the disk selector is provided so as to be capable of performing a sliding movement in a horizontal direction; the disk selector comprises a flat cam in which a protrusion provided on the disk holding member is capable of performing a sliding movement; and the tip of the cam is wedge-shaped so that the disk holding members above and below the desired disk rise and fall in accordance with the sliding movement of the disk selector.

In the case of the present invention as detailed above, because the tip of the cams are wedge-shaped, in comparison with a case where the disk holding member is made to rise and fall

by means of a single slanting cam, a suitable space is easily formed by retracting the disk holding member in two directions, namely above and below the desired disk. Therefore, even when the drive unit comprises mechanisms such as a clamper and a turntable that chuck the disk by sandwiching the disk from above and below, the drive unit is capable of performing reliable chucking by moving the drive unit into the space. In particular, the cam is a flat cam in which there is no multiplicity of level differences as in the case of a step-like cam and, therefore, a smooth operation is possible.

Further, the desired disk can be placed by completely retracting the disk holding members above and below the desired disk by causing the disk selector to perform a sliding movement in a state where the disk itself is grasped by disk grasping means, and then causing the drive unit to move into the space. Therefore, a complex operation is not required of a specified disk holding member in order to transfer the disk from the disk holding member to the drive unit, and the cam and driving mechanism of the disk selector can be simplified.

In a preferred embodiment, elevation means that causes the disk selector to rise and fall in accordance with the height of the desired disk is provided.

In such an aspect, after the disk selector has been aligned by the elevation means, the disk holding member can be retracted from the desired disk by only causing the disk selector to perform

a sliding movement. Therefore, the operation of the disk selector can be simplified.

In a preferred embodiment, the disk drive further comprises a disk selector driving mechanism that operates by means of a single drive source such that a pair of the disk selectors operates in sync.

In such an aspect, by using a plurality of disk selectors, the disk holding member can be made to rise and fall stably and the addition of a drive source can be suppressed.

In a preferred embodiment, the cam comprises an upper cam that raises the disk holding member above the desired disk holding member, a lower cam that lowers the disk holding member below the desired disk holding member and a middle cam provided between the upper cam and the lower cam that holds the desired disk holding member, in order to form a space that allows mounting and removal of a disk above or below the desired disk holding member in accordance with the sliding movement of the disk selector, wherein the middle cam communicates with the upper cam or the lower cam so as to raise or lower the desired disk holding member in accordance with an additional sliding movement of the disk selector.

In such an aspect, the holding of the desired disk holding member by the middle cam during disk insertion and the retraction of the desired disk holding member by the upper and lower cams during disk playback can be executed distinctly by means of a simple sliding movement of the disk selector.

In a preferred embodiment, a pair of the disk selectors are arranged on one pair of side portions of the disk holder that are orthogonal to each other; and the drive unit, and disk insertion/ejection means that inserts and ejects the disk into and from the disk holder are arranged respectively on the other pair of side portions of the disk holder that are orthogonal to each other.

In such an aspect, the disk selector for which the required space is relatively small and the drive unit or disk insertion/ejection means for which the required space is relatively large are provided in opposing positions with the disk holder sandwiched between the disk selector and the drive unit or disk insertion/ejection means, whereby one of the depth direction and width direction of the disk drive does not increase and overall compaction can be achieved.

A preferred embodiment is a drive unit driving mechanism comprising a drive unit for playing back disks, a drive base for supporting the drive unit, and drive base movement means that allows the drive base to move into a space that is produced through division of a disk holder that is capable of storing a plurality of disks, comprising: an elastic member that elastically supports the drive unit on the drive base; and a floating lock mechanism that is driven by the drive base movement means and switches between a floating state where the drive unit is supported by only the elastic member and a locked state where the drive unit is fixed

to the drive base, wherein the drive unit is provided with a turntable where a disk to be played back is mounted and a disk clamping mechanism that is driven by the drive base movement means and which sandwiches the disk to be played back between the disk clamping mechanism and the turntable; and a single drive source that allows the serial operation of the drive base movement means, the floating lock mechanism and the disk clamp mechanism is provided.

In such an aspect, because the switching of the floating lock mechanism and the driving of the disk clamping mechanism are performed together with the movement of the drive base by the drive base movement means, simplification and miniaturization of the mechanism are possible through the combined usage of the drive portion.

Further, because the drive unit, floating lock mechanism and disk clamping mechanism can be made to operate by means of a single drive source, the required space can be restricted.

In a preferred embodiment, the drive base can be turned by the drive base movement means.

In such an aspect, the drive base can be inserted in the divided disk holder as a result the drive base turning and, therefore, the required space of the drive base is reduced in comparison with a case where the member supported on the side of the opposing inside faces within the disk drive is made to perform a sliding movement.

In a preferred embodiment, the floating lock mechanism comprises a slide lock plate provided so as to be capable of performing a sliding movement on the drive base in order to reduce the height of the elastic member by biasing the drive unit toward the drive base side in the locked state and restore the height of the elastic member by releasing the drive unit in the floating state.

In such an aspect, when the drive unit is made to move into the divided disk holder, by reducing the height for the locked state, the moving parts can be as thin as possible, whereby the partition width of the disk holder can be suppressed and collisions with the disk holder can be prevented.

In a preferred embodiment, the disk clamping mechanism comprises a clamper arm that changes position in accordance with the movement of the slide lock plate and a clamper ring that contacts and moves away from the disk in accordance with the change in position of the clamper arm.

In such an aspect, the switching of the floating lock mechanism and the mounting and removal of the disk onto and from the turntable can be easily synchronized.

In a preferred embodiment, single biasing means that biases the drive base and the slide lock plate such that the transition from one to the other of the movement of the drive base and the sliding movement of the slide lock plate is performed continuously is provided.

In such an aspect, transitions in the course of a series of operations such as the movement of the drive base into the disk holder, the floating state of the drive unit, the locked state of the drive unit, and the movement of the drive base out of the disk holder can be performed smoothly by single biasing means.

CLAIMS

1. (Amended) A disk drive comprising a disk holder that comprises a plurality of disk holding members that individually hold a plurality of disks, a drive unit for playing back a desired disk, a disk selector that forms a space above and below the desired disk by causing the disk holding members to rise and fall; and drive movement means that allows the drive unit to move into a space that is formed by the rise and fall of the disk holding members,

wherein the disk selector is provided so as to be capable of performing a sliding movement in a horizontal direction;

the disk selector comprises a flat cam in which a protrusion provided on the disk holding member is capable of performing a sliding movement;

the tip of the cam is wedge-shaped so that the disk holding members above and below the desired disk rise and fall in accordance with the sliding movement of the disk selector; and

disk grasping means, which grasps the desired disk when the disk holding members are raised and lowered by the disk selector, is provided so as to be capable of moving in a direction parallel to the disk surface.

2. The disk drive according to claim 1, wherein elevation means that causes the disk selector to rise and fall in accordance

with the height of the desired disk is provided.

3. (Deleted)

4. (Amended) The disk drive according to claim 1 or 2, further comprising:

a disk selector driving mechanism that operates by means of a single drive source such that a pair of the disk selectors operate in sync.

5. (Amended) The disk drive according to any one of claims 1, 2 and 4, wherein the cam comprises an upper cam that raises the disk holding member above the desired disk holding member, a lower cam that lowers the disk holding member below the desired disk holding member and a middle cam provided between the upper cam and the lower cam that holds the desired disk holding member, in order to form a space that allows mounting and removal of a disk above or below the desired disk holding member in accordance with the sliding movement of the disk selector,

wherein the middle cam communicates with the upper cam or the lower cam so as to raise or lower the desired disk holding member in accordance with an additional sliding movement of the disk selector.

6. (Amended) The disk drive according to any one of claims

1, 2, 4 and 5, wherein a pair of the disk selectors are arranged on one pair of side portions of the disk holder that are orthogonal to each other; and

the drive unit, and disk insertion/ejection means that inserts and ejects the disk into and from the disk holder are arranged respectively on the other pair of side portions of the disk holder that are orthogonal to each other.

7. (Amended) A drive unit driving mechanism having a drive unit for playing back disks, a drive base for supporting the drive unit, and drive base movement means that allows the drive base to move into a space that is produced through division of a disk holder that is capable of storing a plurality of disks, comprising:

an elastic member that elastically supports the drive unit on the drive base; and

a floating lock mechanism that is driven by the drive base movement means and switches between a floating state where the drive unit is supported by only the elastic member and a locked state where the drive unit is fixed to the drive base,

wherein the drive unit is provided with a turntable where a disk to be played back is mounted and a disk clamping mechanism that is driven by the drive base movement means and which sandwiches the disk to be played back between the disk clamping mechanism and the turntable; and

a single drive source that allows the serial operation

of the drive base movement means, the floating lock mechanism and the disk clamp mechanism is provided.

8. (Deleted)

9. (Amended) The drive unit driving mechanism according to claim 7, wherein the drive base can be turned by the drive base movement means.

10. (Amended) The drive unit driving mechanism according to claim 7 or 9, wherein the floating lock mechanism comprises a slide lock plate provided so as to be capable of performing a sliding movement on the drive base in order to reduce the height of the elastic member by biasing the drive unit toward the drive base side in the locked state and restore the height of the elastic member by releasing the drive unit in the floating state.

11. (Amended) A drive unit driving mechanism having a drive unit for playing back disks, a drive base for supporting the drive unit, and drive base movement means for moving the drive base into a space that is produced through division of a disk holder that is capable of storing a plurality of disks, comprising:

an elastic member that elastically supports the drive unit on the drive base; and

a floating lock mechanism that is driven by the drive

base movement means and which switches between a floating state where the drive unit is supported by only the elastic member and a locked state where the drive unit is fixed to the drive base,

wherein the floating lock mechanism comprises a slide lock plate that is provided so as to be capable of performing a sliding movement on the drive base in order to reduce the height of the elastic member by biasing the drive unit toward the drive base side in the locked state and restore the height of the elastic member by releasing the drive unit in the floating state;

the drive unit is provided with a turntable where a disk to be played back is mounted and a disk clamping mechanism that is driven by the drive base movement means and which sandwiches the disk to be played back between the disk clamping mechanism and the turntable, and

the disk clamping mechanism comprises a clamper arm that changes position in accordance with the movement of the slide lock plate and a clamper ring that contacts and moves away from the disk in accordance with the change in position of the clamper arm.

12. The drive unit driving mechanism according to claim 11, wherein single biasing means that biases the drive base and the slide lock plate such that the transition from one to the other of the movement of the drive base and the sliding movement of the slide lock plate is performed continuously is provided.